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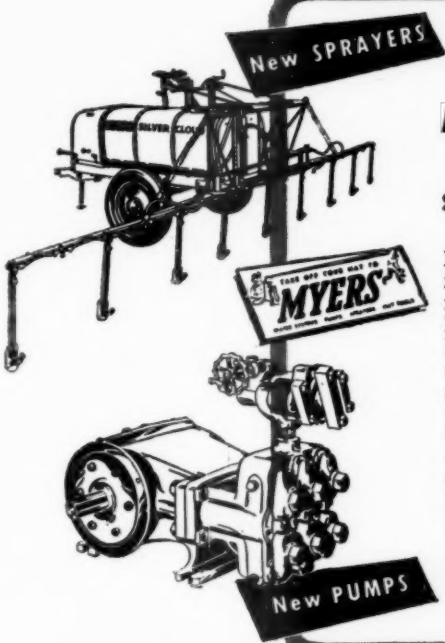

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BACTERIAL RING ROT OF POTATOES[1]

Present status of this disease compiled by

BERNARD BARIBEAU[2]

Ste. Anne de la Pocatiere, Province of Quebec, Canada

Previous to 1931 bacterial ring rot of potatoes was unknown on this continent. Since then the disease has brought alarming losses to the merchant because ring-rotted tubers cause a storage rot; to the table-stock grower because the rot in the field decreases the yield; to the certified seed grower because the presence of even one ring rot plant or tuber disqualifies a field from certification and the attendant premium in price.

NAME—Some confusion has apparently arisen in the literature from the use of different terms and classification of this new and highly infectious disease.

Appel (1906) published a description of a potato disease which he called "bacterial ring disease." Spieckermann (1913) established the common name "Bacterienringfäule" for this disease in Europe. In Canada, Baribeau (1931) referred to a new potato disease as "Bacterial Wilt" and in later reports (1935) used the name "Flétrissure Bactérienne" and in (1937) "Flétrissure Bactérienne et Pourriture Molle." Savile and Racicot (1937) suggested that the disease be known by the popular name "Bacterial Wilt and Rot." Bonde (1937) described a new disease of potatoes in Maine which he called "Bacterial Wilt and Soft

[1]Contribution No. 64—Division of Plant Protection, Science Service, Dominion Department of Agriculture, Ottawa.

[2]District Inspector in charge Seed Potato Certification Office.

Rot." In France, Lansade (1942) reports that this disease is known as "Flétrissement Bactérien."

HISTORY—The first record of the disease is from Germany where it was described by Appel (1906). It has been reported present in the province of Quebec by Baribeau (1931) and since 1931 this disease has been found in all Canadian provinces. Jorstad (1932) observed it in Norway, and Lansade, in France, reports that "le flétrissement bactérien" was observed in 1934, but probably this malady has long been confounded with "Verticilliose." According to Bonde (1937) the disease was present in Maine in 1932, and data recorded by Metzger show that it was prevalent in Colorado in 1938. Brentzel reported that the disease had reached North Dakota by 1939. Belova noted it in Russia in 1940. In 1939, in the United States, the disease had been reported definitely from 27 states, and at the present time, from 45.

CLASSIFICATION—Spieckermann and Kotthoff (1914) fully described the organism and first used the name *"Bacterium sepedonicum."* Jensen (1934) suggested that the bacterium causing ring rot of potatoes should be classified as a *Corynebacterium*. Magrou (1937) placed the pathogen in the genus *Phytomonas* and this only three months previous to Savile and Racicot (1937). For the sake of uniformity and to avoid confusion it was recommended at a meeting held at Columbus, Ohio, in December 1939, that the common name "Ring Rot" be adopted and in French "Pourriture Bactérienne du Cerne" for the potato disease caused by *"Phytomonas sepedonica."* Finally, Skaptason and Burkholder, (1942) with evidence at hand proposed to place the organism in the genus Corynebacterium. Therefore the pathogen responsible for this disease would be known as *"Corynebacterium sepedonicum.* (Spieck. and Kott.) Skap. and Burk.

ECONOMIC IMPORTANCE—Bacterial ring rot is of great economic importance and one of the most serious diseases of the potato not only in this country but throughout North America and Europe. The highly infectious nature of the disease and the extensive interprovincial and international movement of potatoes and potato containers create a potential menace to the potato industry.

Nature of Loss from This Disease: 1—There is a reduction in yield because of the rotting of tubers in the field. This may vary from one rotted potato to 75 per cent. Therefore, in the fall, dealers hesitate to purchase potatoes from supposedly infected districts, fearing loss through rot. 2—Storing of potatoes from badly affected fields may result in considerable decay and breakdown because of complications from secondary organisms as well as contaminations of premises. 3—The breaking down of tubers in sacks and containers in transit may

necessitate the added expense of regrading, repacking and disinfecting of bags, graders and storages. 4—Growers of certified seed suffer not only from reduced yield, but also from reduced market prices as well as loss of customers resulting from the failure of their fields to receive certification.

Baribeau (1935) has shown that this disease was present in 43 per cent of the commercial potato fields in thirty counties of the province of Quebec and the loss caused to the crop by soft rot varied from 20 to 45 per cent. In 1944, 15.7 per cent of the potatoes that had passed certification for other diseases were rejected because of bacterial ring rot and in 1945, the rejections caused by ring rot were 8.6 per cent. In 1946, a survey of 378 fields planted with table stock revealed that 74.6 per cent of the fields were found to be affected with bacterial ring rot. At digging time, 7 per cent of the tubers from these affected fields were showing rot. Bonde (1939) claims that certified seed growers in Aroostook county, Maine, sustained a loss of $32,000 in 1937 and $80,000 in 1938. In 1937, 11 per cent of the potatoes that had passed certification were rejected because of ring rot and in 1940, 7.5. Eddins (1938) states that the loss from the disease at Hastings, Florida, was 5 per cent in 1937 and that this was reduced to 0.5 per cent in 1939 when strict attention was paid to the source of seed. Statements like those of Leach and others (1940) are observed in the literature. "The estimated loss in one county is from 500 to 700 cars plus reduced prices on several thousand cars." "Ring Rot is of a major importance. The loss in 1939 was probably $250,000." In France, during the years 1934 to 1938, bacterial wilt showed as high as 20 to 30 per cent infection of the plants in the most severely affected fields.

SYMPTOMS—Yellowing, wilting and drooping of the leaflets are usually not observed until late in the season. Affected leaflets initially develop a mild chlorotic appearance which progresses through a pale green stage to a yellow. This sequence of symptoms usually starts with the lower leaves of the plant, this continues rapidly until the plant wilts and eventually dies. In France, the second year symptoms are described under the French name of "nanisme, rosette, court-noué," which names are more apparent on the two middle stalks. These symptoms of "nanisme" have not been observed on this continent. (Fig. 1.) Tuber symptoms may vary from that of no apparent infection to that of complete disintegration. The decay begins in the region of the vascular ring of the tuber. It may affect any part of the ring or the entire ring, in the latter case causing a ring rot appearance, the tuber shows a yellowish discoloration in the region of the vascular ring which contains innumerable ring rot bacteria. This decayed material may be forced out from the infected vascular ring if the tuber is squeezed in the hand.

FIGURE 1—Plant from a diseased set on which the discoloration of the vascular ring is very apparent as illustrated above.—Note the dwarfing of the two middle stalks and the newly formed tubers already affected by this typical rot. This illustrates second year symptoms of bacterial ring rot, such a progeny disappears within two or three years. (Photo. courtesy of Messrs. P. Limasset and A. Lansade, Versailles, France.)

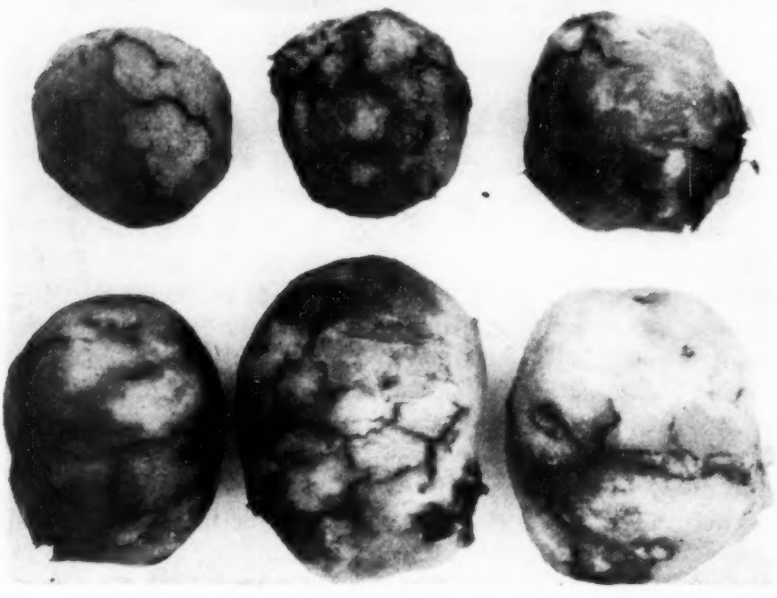

FIGURE 2—Tubers showing external symptoms of bacterial ring rot. Typical cracking in the Green Mountain variety. (Photo 1936 B. Baribean).

OVERWINTERING—The pathogene overwinters in the tubers. To date, there is no proof that the pathogen can live over winter in the soil or in the remains of diseased potatoes. The tubers may carry the bacteria without showing any signs and therefore it is impossible to select disease-free seed from an infected crop. The bacteria may also remain viable from September to May on a dry surface of metal stored in unheated field barn, as well as for many months on bags and bin walls.

SPREAD—The pathogene may be disseminated by infected tubers and from them, by cutting knives, planters, bags, etc. The bacteria from the decayed tubers, when smeared on the surface of healthy tubers, may remain alive all winter in the dry state, and infect the sets when the tuber is cut and planted. Ring rot is so infectious that a cutting knife drawn through a diseased tuber can transmit the disease to the next twenty-five healthy tubers. Because of this marked infectivity, ring rot may increase from a trace in one season to as much as 60 per cent in the next. In France, the disease is transmitted from year to year by the mother tuber, but such a progeny disappears in two or three years.

CONTROL—Ring rot is a highly infectious disease but its control is entirely possible by the use of disease-free seed (certified), disinfection of warehouse, cellars, tools, planters, diggers and graders, and by the use of new or disinfected bags. Whole seed is recommended in preference to cut seed for planting. Most of the provincial governments have enacted legislation for the control of ring rot disease. In addition, certain sanitary measures must be carried out by all those planting and handling potatoes.

For the disinfection of storages, cellars, bins, warehouses, etc., spray with a solution containing 2 lbs. blue stone in 10 gal. of water, or 1 pint of formalin (formaldehyde) in 25 gal. of water, or 2 per cent Lysol. For tools, machines, planters, graders, barrels, crates, baskets, etc., spray with a solution containing 1 pint of formalin in 25 gal. of water or for machinery, using 3 teaspoonfuls of Lysol to a gallon of water. For sacks (bags), gloves, etc., soak for 2 hours in a solution containing 1 pint of formalin in 25 gal. of water. For cutting knives, a good disinfecting solution may be made by dissolving 2 corrosive sublimate tablets in 1 pint of water, (making a 1-500 solution or 1 ounce to 3½ gal. of water,) or use a Lysol solution, 3 teaspoonfuls to one gallon of water.

RESISTANCE TO RING ROT—No varieties are immune to this disease but the "Teton" has shown a high degree of resistance to

ring rot over a period of years in Wyoming and Maine. In France, the "Furore" variety has never shown any trace of infection.

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PROMISING NEW CHEMICALS FOR THE CONTROL OF DISEASES AND INSECTS

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This discussion includes the results of two separate experiments both conducted with the Katahdin variety. The first part of the discussion will deal with the comparison of six fungicides in the National Cooperative Potato Spray Fungicide Experiment whereas the second part deals with an experiment in which seven insecticides and two fungicides were compared.

The fungicide experiment contained the following treatments to all of which 1.5 pounds of 50 per cent wettable DDT were added for each 100 gallons.

TABLE 1.—*Potato spray fungicide experiment*

Treatment	Total Yield Bus. per Acre	Total Insect Population 520 Sweeps		
		Flea Beetle	Leafhopper	Aphid
1. Check, DDT 1½—100	403.5	1049	34	3619
2. Check, Bordeaux 8-8-100	404.7	118.3	25	3341
3. Dithane D14 2 qts.—100	464.2	1326	59	3046
4. Zerlate 2-100	431.2	918	28	3376
5. Phygon 1-100	404.2	1509	50	2999
6. C-O-C-S 4-100	385.0	1385	48	2843
7. Parzate 2-100	435.5	1294	36	2964
*8. Tri-Basic Copper 4-100	449.7	1438	58	3125
L. S. D. at 5%=33.1 bus. per acre				

*Randomized with adjoining experiment but can logically be compared with other fungicides.

Eight applications were made, starting on the 19th of June and ending the 11th of August. A four-row power driven sprayer equipped with three nozzles per row and delivering 125 gallons per acre at 300 pounds pressure, was used.

Disease counts were made on ten plants in two of the four replicates on the 1st of August and again on the 12th. Only .5 of 1 per cent of the leaves in the no-fungicide check plots were infected with late blight on each date and no early blight was noted. Not a single plant was found with more than 2 per cent of its foliage infected.

Insect sweepings were taken thirteen times from ten places in each of the four replicates making a total of 520 sweepings from each treatment. The total number of flea beetles, leafhoppers and aphids for each treatment was quite similar for the various treatments in the fungicide test. However, it is interesting to note in table 1 that the flea beetle population was somewhat lower on the plots sprayed with Zerlate + DDT than on any other treatment, whereas flea beetles were noticeably more plentiful on plots sprayed with Phygon + DDT. Possibly Zerlate

has some insecticidal value against flea beetles. The population of leafhoppers and aphids did not follow this same trend.

The experiment was harvested on the 29th and 30th of September and total yields were secured from 1/40 of an acre in each replicate. Plots sprayed with Dithane D14, + Zinc Sulfate and lime + DDT produced an average yield of 464.2 bushels per acre, a significantly higher average than was produced by any of the other treatments with the exception of Zerlate and Parzate which produced 431.2 and 433.5 bushels per acre, respectively.

An analysis of variance indicates that a difference of 33.1 bushels per acre are required for significance at the 5 per cent point. Plots sprayed with Parzate and Zerlate produced significantly higher yields than did plots sprayed by C-O-C-S, whereas plots sprayed with DDT alone, Bordeaux or Phygon produced intermediate yields of 403.5 and 404.2 and 404.7 bushels per acre, respectively. C-O-C-S sprayed plots produced the lowest average yield of 385.0 bushels per acre. However this yield was not significantly lower than the plots sprayed with Bordeaux, Phygon or DDT alone. The increases in yield over the other treatments produced by the plots sprayed with Dithane D14 were obviously not due to either disease or insect control since the incidence of disease and insects found on these plots was as great as on those sprayed with Bordeaux + DDT or DDT alone. Therefore we are not in a position to state the reason for this increased yield, however it may be due to stimulation.

In the same field and in an area of equal size and adjacent to this test we conducted another experiment to compare the value of several insecticides when used in combination with 8-8-100 Bordeaux. However, one series of plots was sprayed with Tri-Basic copper 4 lbs. to 100 plus 1½ lbs. of DDT as used in the National Fungicide Test. This series produced an average yield of 449.7 bushels per acre. This yield is significantly higher than the yields produced by plots sprayed with DDT alone, Bordeaux, Phygon or C-O-C-S, was slightly greater than those sprayed with Zerlate or Parzate and approaches the yield of the plots sprayed with Dithane D14. Since this treatment was randomized with a Bordeaux-DDT check which produced a yield similar to the Bordeaux check in the National Fungicide test it is believed that we are justified in comparing the Tri-Basic copper plots with the treatments in the fungicide test.

In the experiment set up to evaluate the effectiveness of certain insecticides the following treatments were used.

As mentioned before, this experiment was located in the field with the fungicide experiment and was sprayed on the same dates with the same equipment. Disease counts were taken here also and in no case

did we find more than 2 per cent of the leaves of any plant infected and less than 1 per cent was found on the average. Insect sweepings were taken thirteen times as in the other test and the total population for the five hundred and twenty sweepings is recorded with the yields in table 2.

Plots sprayed with Bordeaux + Parathion produced the highest yield, namely 462.0 bushels per acre, and gave by far the best control of aphids but only fair control of leafhoppers and relatively poor control of flea beetles. This yield was significantly higher than that produced by plots sprayed with Chlordane, Rhothane or Toxaphene and is within .6 of a bushel of being significantly better than those sprayed with 2 pounds of 50 per cent wettable DDT. A difference of 39.6 bushels per acre are required for significance at the 5 per cent point. Bordeaux plus 2 pounds of Toxaphene caused very noticeable injury to the plants resulting in a loss of chlorophyll and curling of the leaves. It also gave poor control of aphids and leafhoppers and only fair control of flea beetles. At the first application 4 pounds of 25 per cent Toxaphene were used per 100 gallons of water but the injury was so severe that 2 pounds were used in all subsequent applications. However even this concentration caused injury and the average yield was only 344 bushels per acre,

TABLE 2.—*Potato spray insecticide experiment*

Treatment	Total Yield Bus. per Acre	Total Insect Population 520 Sweeps		
		Flea Beetle	Leafhopper	Aphid
8. Tri-Basic Copper 4-100 + 1½# 50% DDT	449.7	1438	58	3125
9. Bordeaux 8-8-100 + 2# 25% BHC	450.7	1933	122	1327
10. Bordeaux 8-8-100 + 2# 15% Parathion (3422)	462.0	2441	88	190
11. Bordeaux 8-8-100 + 2# 50% Chlordane	404.5	1624	98	3230
12. Bordeaux 8-8-100 + 2# 25% Toxaphene	344.0	1653	176	2908
13. Bordeaux 8-8-100 + 2# 50% Rhothane	402.5	2091	58	2294
14. Bordeaux 8-8-100 + 1 qt. 25% DDT Emulsion	428.7	1288	53	455
15. Bordeaux 8-8-100 + 2# 50% DDT	423.0	914	59	1386
*2. Check, Bordeaux + 1½% 50% DDT	404.7	1049	34	3619
L. S. D. at 50% = 39.6 bus. per Acre				

*Part of fungicide test shown here for comparison of insect control between 1½ lbs and 2 lbs. of DDT per 100 gallons of spray.

significantly less than that produced by any other treatment. Plots sprayed with Bordeaux + BHC or Tri-Basic Copper + 1½ pounds DDT produced much higher yields than did those sprayed with Bordeaux plus Chlordane, Toxaphene or Rhothane. Bordeaux + BHC or wettable DDT gave fair control of aphids but DDT was superior to BHC in the control of leafhoppers and flea beetles. There was practically no difference in yield between the plots sprayed with DDT emulsion and 50 per cent wettable DDT. Although there were three times as many aphids on the plots sprayed with wettable DDT as on those sprayed with DDT emulsion, it is also interesting to note that increasing the rate of DDT from 1½ pounds to 2 pounds per 100 gallons resulted in slightly better control of flea beetles and much better control of aphids, but made no difference in the control of leafhoppers. The best control of flea beetles was obtained with 2 pounds of DDT.

Conclusion

The use of Dithane D14 + Zinc Sulfate and lime resulted in the highest yield, although not significantly higher than Zerlate, Parzate or Tri-Basic copper. Plots sprayed with C-O-C-S returned the lowest yield but not significantly lower than the yields from plots sprayed with Bordeaux, Phygon or DDT alone. Differences were not due to disease control since so little disease was present on the check.

Among the insecticides under test Parathion (3422) was outstanding in its control of aphids and resulted in the highest yield. Plots sprayed with BHC, DDT emulsion and wettable DDT were similar in yield and these yields were not significantly lower than the yield produced by the use of Parathion. DDT emulsion gave better control of aphids than DDT powder whereas DDT powder gave best control of flea beetles. Toxaphene caused severe plant injury and resulted in poor insect control.

THE EFFECT OF DIFFERENT RATES OF APPLICATION OF 2, 4-D ON THE YIELD OF POTATOES

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INTRODUCTION

The control of weeds in potato fields on muck soil has always been a problem and frequently is responsible for a major portion of the cost of producing a crop. Due to the present cost of labor necessary for hand weeding, this experiment was conducted to ascertain the possibility of including a chemical weed killer such as 2, 4-dichlorophenoxyacetic acid commonly called 2, 4-D, in regular potato spray mixture.

MATERIALS AND METHODS

The Katahdin variety of potatoes was planted on the 12th of June in rows three feet apart. The hills were spaced twelve inches apart in the row. A sodium salt of 2, 4-D containing 70 per cent dichlorophenoxyacetic acid was used as the weed killer. Four rates of application of 2, 4-D were incorporated into the potato spray, which consisted of four pounds of Basi-cop and one and one-half pounds of 50 per cent DDT per one hundred gallons. A treatment coontaining no chemical weed control served as the check treatment. The amounts of 2, 4-D applied started with one-quarter pound of 70 per cent sodium salt per one hundred gallons of spray and increased in quarter pound increments up to and including one pound per one hundred gallons. The spray was applied at the rate of approximately one hundred twenty-five gallons per acre, thus making the amounts of 2, 4-dichlorophenoxyacetic acid applied on a per acre basis .218, .437, .655, and .875 pounds respectively.

OBSERVATIONS AND RESULTS

The first application of 2, 4-D was incorporated in the regular potato spray applied on the 15th of July, thirty-three days after planting. Two days after the application, considerable distortion of the potato vines was observed on the .875 pounds per acre rate, and a slight amount of distortion on the .655 pound rate. The vines recovered from this distorted condition after a few days. The .218 and .437 pound rates created no distortion of the vines. The .655 and .875-pound rates resulted in satisfactory control of all broad leaf weeds. Smart weed comprised a majority of the broad leaf weeds present. The 437-pound rate caused some weed distortion but was not sufficiently strong to completely kiil the weeds. The .218-pound rate yielded no visible results.

Observations made during the week of the 11th of August, revealed

that blossoming was inhibited by applications of 2, 4-D. The check plots which had received no 2, 4-D bloomed profusely. The amount of bloom decreased as the amounts of 2, 4-D in the treatments increased. Only a few blossoms were observed on the plants which received the .655-pound per acre application, and no blooms were present on the plants which had been sprayed with .875-pound of the 2, 4-dichlorophenoxyacetic acid per acre. These applications were made before the plants had bloomed. Ennis, *et al.* (1) reported increased fruit setting from applications of 2, 4-D made at time of blossoming.

The second application of 2,4-D was included in the potato spray applied on the 20th of August. Weed control effects were similar to those occurring after the first application. After the second application the potato vines receiving the one pound rate did not seem to undergo as severe distortion as that observed as a result of the first application.

Killing frosts occurred on the 22d of September. On the 24th of October, twenty hill samples were dug by hand from each plot. The weights of No. 1 size tubers were recorded and the yields calculated on the basis of one hundred-pound bags per acre. The data are presented in table 1.

TABLE 1.—*Yields of potatoes from plots which had been treated with various amounts of 2, 4-D incorporated in the regular spray.*

Treatment	Replications			Total Yield	Average Yield	Yield 100 Lbs. Bags Per Acre
	I	II	III			
Spray, No. 2, 4-D	*23.8	*23.1	*17.4	64.3	*21.4	155.3
Spray ¼# 2, 4-D/100 gal.	21.6	20.3	22.1	64.0	21.3	154.6
Spray ½# 2, 4-D/100 gal.	23.8	18.7	19.9	62.4	20.8	151.0
Spray ¾# 2, 4-D/100 gal.	17.1	18.9	20.4	56.4	18.8	136.4
Spray 1# 2, 4-D/100 gal.	21.8	17.5	23.7	63.0	21.0	152.4

*Yield in pounds from 20 hills.

The yields for all plots were below normal caused by late planting and a prolonged drought period during the summer. The difference in yields between extremes on a per acre basis was only eighteen and nine-tenths bags. The differences in yields between treatments were not found to be significant. Weed competition was not an influential factor in the yields since all weeds from check plots and remaining weeds in treated plots were removed by hand.

The yields from this experiment are in line with the findings of Ennis, W. B. *et al.* (1) in which they studied the effects of various growth-regulating compounds on Irish potatoes. In their work the

growth-regulating compounds were not incorporated in the potato spray mixture. They observed however, that 2, 4-dichlorophenoxyacetic acid applied in aqueous solution had no detrimental effect on top growth or tuber yield.

Conclusions

These results indicate that control of weeds in potato fields may be possible by incorporating a weed killer with the regular potato spray mixture. Applications of as much as .875 pounds per acre of 2, 4-dichlorophenoxyacetic acid applied in the form of the 70 per cent sodium salt resulted in control of weeds and no significant decrease in yield of Katahdin variety potatoes.

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THREE NEW VARIETIES OF IRISH POTATOES

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Since 1935 the Louisiana Agricultural Experiment Station has been conducting a breeding program with Irish potatoes with the following purposes in view: Breed varieties having a greater adaptability to the short days of the south, resistance to mild and rugose mosaic and other factors which make for general adaptability such as keeping quality and market preference. In this work it has been kept in mind that new varieties must not only produce well in Louisiana but they should also produce satisfactorily in northern seed-producing areas. The more promising seedlings therefore have been tested not only in the south but also in the north.

Since the program began, more than 100,000 seedlings have been grown and tested. Of these only three seedlings have been selected as outstanding and worthy of introduction. Two are red varieties and one is white. The first red variety to be named is DeSota and the second one is LaSoda. Both of these varieties are the result of crosses between Triumph and Katahdin. Th white variety, LaSalle, is a cross between Chippewa and an inbred line of the Triumph. LaSalle and DeSota were named after two early Mississippi Valley explorers. Since only a beginning has been made in exploring the possibility of potato breeding these names seemed appropriate. The LaSoda was named after Louisiana

[1]Cooperating with the U. S. Department of Agriculture.

and South Dakota. The growers and potato organizations of South Dakota, in the cooperative tests with the Louisiana Station, became impressed with the performance of LaSoda, formerly called L 36, that they requested the new variety to be named after the two states. A brief description of the three new varieties follows:

DeSota

The De Sota is a cross between the Triumph and Katahdin and was first grown as a seedling in the fall of 1938. The plants are vigorous and upright in habit, with leaves that are very small and similar to those of the Triumph. It blooms freely and the flowers are purple. The tubers are round to slightly oblong and the color of the skins varies from red to pinkish red. The eyes vary from a medium depth to shallow. This variety is medium early in maturity. It is resistant to mild mosaic.

LaSoda

The LaSoda is a cross between the Triumph and Katahdin and was first grown in the fall of 1936. The plant is of medium vigor and very upright with medium to small leaves. It blooms more freely than the Triumph and the flowers are purple. Its tubers vary from semi-round to slightly oblong, similar to those of the Katahdin, the color of which is a very bright pinkish red, and the skin is very smooth. The eyes are medium in depth to very shallow. This variety is early to medium early. Even though it shows some resistance to mosaic it is not in any way immune.

LaSalle

The LaSalle is a cross between the Chippewa and an inbred seedling of the Triumph. It was first grown as a seedling in the fall of 1936. The plants are medium in vigor and very upright in habit. The flowers are white. The tubers are semi-flat and slightly oblong and the skin is white, with shallow eyes well distributed over the tuber. This variety is medium early and is very resistant to mild mosaic.

In table 1 the yields of the three Louisiana varieties are given and these are compared with the Triumph, which was used as a standard, as Triumph is the principal variety grown in Louisiana. The seed are from three different sources,—namely, (1) Lousiana spring, seed which was harvested in the spring and held in cold storage at 40° F. from the 15th of June to the 15th of January and removed for planting; (2) seed grown in the northern areas, and (3) seed grown in the fall in Louisiana and harvested on the 25th of November and stored at 80° F. to hasten the rest period until the time of planting. Comparable lots of Triumph were used.

It will be noted, in table 1, that in every instance each of the three new varieties significantly outyielded the Triumph, and that northern and Louisiana spring-grown seed significantly outyielded Louisiana spring-grown seed.

TABLE 1.—*Yield (Bushels per acre of marketable potatoes) and source of seed test of three new Louisiana Irish potatoes.*

Variety	Source of Seed			Variety[1] Average
	Louisiana Spring	Northern	Louisiana Fall	
Triumph	87	163	152	134.0
De Sota	115	224	205	181.3
LaSoda	96	254	189	179.7
LaSalle	121	216	223	186.7
Source of Seed[2] Average	104.8	214.3	192.3	

[1]Difference necessary for significance—23.20 bus.
[2]Difference necessary for significance—20.08 bus.

It is with hesitation that two red varieties have been released but each has a contribution that cannot be overlooked. The DeSota is resistant to mosaic whereas Triumph is very susceptible. It is felt that that reason alone warrants its release, but it has produced higher yields in Louisiana than the Triumph. As for the appearance of the potato on the market it is very difficult to tell the difference between the DeSota and Triumph. The LaSoda although not mosaic resistant produces higher yields than the Triumph and the potato has a bright red velvet appearance which attracts the consumer appeal so much that this variety when placed on the market has sold at 15 to 25 cents per hundred premium compared with other varieties. This fact alone cannot be overlooked. The LaSalle, a white variety, also produced much higher yields than the Triumph and in maturity is similar to that of the Cobbler. It is believed by many who have tested this variety that it might replace the Cobbler in many areas. The tubers are much smoother than the Cobbler and the plant is very resistant to mild mosaic. It has been grown continuously in Louisiana for twelve years and to date no plant has been found to be affected with mild or rugose mosaic, even when grown side by side with inoculated plants, over a period of years. These varieties, like all others must be grown in various areas, and if they perform as well in other areas as they have in Louisiana they will continue to be increased. Four seed potato-producing areas are now increasing these varieties for distribution and a limited amount of seed is now available.

SECTIONAL NOTES

ALABAMA

Potatoes in the commercial-producing section of Alabama are emerging seemingly all at once. After a very cold, wet and otherwise backward January, from the 4th of February until the 2nd of March the weather has been ideal for starting our crop. The bulk of 16,000 acres was planted within a period of less than 10 days and indications point to a very good stand, in general. An increasing number of our producers are side-dressing at this time with approximately 600 pounds of additional 4-10-7 in an effort to increase yields and especially the percentage of No. 1 size tubers on light soils.

The chief worry at this time is the danger of a killing frost and growers are covering the young plants as deep as they can to retard their growth. Faith, the very important factor in such an expensive early truck crop, springs eternal in the heart, and our growers have demonstrated that they perhaps have more than their share. The Sebago is favored here because they have a greater comeback after frost because of their longer life period of growth.

All in all our Alabama prospects are very good for this time of year.—FRANK E. GARRET.

FLORIDA

Approximately 25 per cent of the acreage is harvested in the Dade County section. Many of the growers are using Sinox to kill the tops a week to 10 days prior to harvesting, a practice which reduces cracking of the tubers as they drop to the ground from the digger. Early plantings have yielded well and the quality of the crop thus far has been the best in several seasons.

Late blight is under control in later plantings, but aphids and serpentine leaf miners are causing damage, and insecticides are being added to the Dithane-zinc sulfate spray for their control. Dr. D. O. Wolfenbarger, Entomologist at the Sub-Tropical Experiment Station, reports that the new insecticide Parathion is giving the best control of aphids and leaf miners in his test plots of various materials used, including DDT emulsion, Chlordane, Isotox, Vapotone, chlorinated camphene, and calcium arsenate plus nicotine sulfate. Some growers are using Isotox (high gamma-isomer benzene hexachloride) but are limiting treatment to one application to avoid taste contamination in the tubers.

The fungicide test plots at the Sub-Tropical Experiment Station were harvested the 25th of February. The following average yields in bushels per acre, Bliss Triumph potatoes, from the different treatments

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● McConnon Super Fused Insecticide ● Fungicide achieves potato insect *and* blight control in *one* easy, efficient operation.

"Super Fusing" is the *exclusive* McConnon process through which toxics and diluents are blended to give the most uniform coverage and impart maximum killing power to every particle of dust or spray.

Leading potato growers with the largest acreages depend on McConnon laboratory and field tested insecticides and fungicides. They use MACK O BLEND for dusting or MACK O SPRAY for spraying—with equal effectiveness and economy. Rely on McConnon for insecticides and fungicides for every need.

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WINONA, MINNESOTA

were as follows: Checks, 93; Dithane-zinc sulfate, 269; Parzate, 249; alternating Cuprocide and Dithane-zinc sulfate, 235; Z-78 (carried over from last year), 217; tribasic copper sulfate, 215; copper-hydro 40, 210; Cuprocide, 207; bordeaux mixture 4-2-50, 201; Copper-A compound, 199; copper-zinc chromate, 182; experimental fungicide HL-275, 154; and experimental fungicide G. Ch. 629-308, 137. The yields obtained were closely comparable to the degree of control of late blight obtained with the various fungicides, which were applied at the same rate and the same nozzle setting at each application for a total of 10 applications during the season.—GEO. D. RUEHLE.

MAINE

The Experiment Station is making a study to determine if there is any increase in the amount of net necrosis, stem-end browning or general discoloration of tubers in transit. Dr. Folsom of the Experiment Station is supervising this study. He is taking samples of several cars as they are being loaded. He will sample these same cars on their arrival in New York. It is expected that his results will be available soon.

Farmers have received the results from their Florida tests and they are outstandingly good. This year only sixteen of the 300 lots of Chippewas had Florida readings of more than 5 per cent disease. None was above the 20 per cent which is the maximum allowed for certification. Approximately 2800 posters have been distributed in the interest of the campaign to plant Blue Tag Certified Seed throughout Maine.

The industry is holding a discussion on a proposed Marketing Agreement which has been drawn up by representatives of the industry. These meetings are being held previous to the formal hearing which has been requested.

A program has also been drawn up by the industry which has not only been presented at the meetings but is being generally approved by the farmers.

Every one in the state is gratified to know that Dick Newdick was selected to go to Europe with Al Mercker. Dick deserves such a trip if any one does and he certainly knows the potato situation from A to Z. He was presented a purse of $1,000 from the seed growers of Maine as an expression of appreciation and as a "going away" present. We are looking forward with interest to his return and to hear his reports of the potato situation in Europe.

The following program was adopted by the Potato Committee at a statewide Production and Marketing Conference. This Committee was composed of State and County P. & M. A. Committeemen, representa-

MODEL PB-3 WEED BURNER

The Model PB-3 is here shown in use in potato fields. Used to destroy green immature vines it permits harvesting operations without waiting for normal maturing of vines or their elimination by killing frost.

Vegetation which has accumulated after cultivating is no longer possible, is completely eradicated and permits efficient digger operation. Clean fields result in fewer potatoes being lost as they can easily be seen by pickers.

The use of the Model PB-3 is not restricted to the burning of potato vines as it can be used wherever weed eradication is necessary.

At a speed of 5 m.p.h. the Model PB-3 consumes 18 gallons of fuel oil per acre and burns 4 rows or a swath 15 feet wide on each trip.

References by potato growers using the Model PB-3 furnished on request. They will give you their actual experience with the use of this machine.

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Pioneer Manufacturers of Open Flame Type Weed Burners

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tives of Maine Agricultural Extension Service, Maine State Department of Agriculture, and potato industry leaders, and adopted resolutions that:

1. A permanent price support program be maintained at a level which will prevent disaster.

2. Potato growers recognize the economic aspects of over-production and recommend the continuation of federal potato acreage allotments.

3. The industry take steps immediately to help itself and to improve the quality of its product for the consumer:

(a) by means of a marketing agreement or similar instrument

(b) by encouraging the increased use of consumer packaging

(c) to mark all containers as to grade and size,—properly and prominently

(d) by revision of federal grading laws to restrict tolerances to bring about uniformity in size as well as quality

(e) by aggressively pursuing through the facilities of the Research and Marketing Act of 1946 and any other means, the development of new and better uses for potato by-products.

4. Until such time as the industry itself can completely handle its off-grade potatoes withheld from market that the federal Government assist by means of diversion programs.

5. The industry develop a better feeling towards itself in the eyes of the consuming public by means of the publication of true and undistorted facts and figures.

6. A committee of a more permanent nature be appointed to further develop and expand this resolution. This committee should consist of five people, one of whom should be the chairman.

7. The permanent committee work with similar committees in other potato-producing areas to develop a long-range agricultural program applicable to all potato producing areas.

Representatives of the Aroostook County Farm Bureau, Potato Industry Council, Institute of Starch Manufacturers and the P. & M. A. recommended, on the 31st of January, 1948, consideration by growers in Maine of a support program for U. S. grade No. 1 at 70 per cent of parity and price support for U. S. grade No. 2 and Size B at 45 per cent of parity.—VERNE C. BEVERLY.

NEW YORK

Table stock supplies seem to be lower than usual for this time of year, with prices rather firm at or above support levels.

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NEW BLIGHT RESISTANT HYBRID POTATOES

We have collaborated with Dr. Reddick testing hundreds of the new crosses here in Northern New York, growing them successfully without spraying except for D.D.T. This year we have several hundred bushel increase of the two outstanding performers—ESSEX (early) and VIRGIL (late). Also some PLACID and small quantities of others can be supplied to Extension and research workers. Send for illustrated bulletin, and price list.

Dr. Donald Reddick, of Cornell University, crossed a blight-proof wild species of potato with cultivated kinds. After twenty-five years he and his associates have produced a number of new varieties that compare favorably in both yield and quality with the leading commercial varieties—AND THEY ARE THE MOST BLIGHT RESISTANT NEW RACE OF HYBRIDS TO DATE!

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Orders for certified seed are a little behind schedule, because of the uncertainty of potato growers regarding their acreage allotment and the high cost of production. Many growers are having labor problems since New York is a highly industrialized area with a good demand for skilled labor. It takes skilled labor to raise potatoes today because of the high investment in machinery and equipment.

There seems to be some sentiment for a long time potato program that would protect against disaster by covering costs, but low enough to prevent undue expansion. Marketing agreements are not, as yet, popular in the mind of the New York grower.

Although we expect an allotment similar to last year, there are indications from some sections that acreage will be reduced. Some of the larger growers are making quite drastic reductions.—H. J. Evans.

South Carolina

The anticipated acreage of early potatoes in South Carolina is the same as last year. For several years the Cobbler has been losing ground as the leading variety and apparently 1947 was the last year it ruled. Inspection certificates on seed-arriving show both the Sebago and Katahdin ahead of Cobbler this year. The Pontiac acreage has also been drastically cut. The usual 2-3 per cent of Bliss and White Rose are now being planted.

Planting usually gets under way by the 1st of February but excessive rains have kept fields boggy and not more than 10 per cent of the acreage has been planted and it is now the 16th. Even if no more rain falls it will be the 1st of March before planting can be completed. Such late-planted potatoes usually do not yield as well as they should.

The washing program started last year, met with such success that the number of washers is being increased. Charleston County alone is expected to have 11 or 12 machines in operation by the harvesting period. When unwashed potatoes were being dumped last June, the washing machine operators could not fill all orders. Washed potatoes also brought a small premium. When shipped under refrigeration, washed potatoes carried quite well. Amazingly, a broker in Hamburg, Germany, wrote about purchasing potatoes as he had observed Army shipments of washed Carolina potatoes arriving there in excellent condition last summer. (Feb. 16).—W. C. Barnes.

Province of Ontario

The potato crop in the Province of Ontario usually has an annual value of more than $20,000,000.00 and occupies about 125,000 acres. During recent years, potato growers have experienced increased diffi-

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1. **Effective Blight Control**—In the North and in the South—growers have found that a thorough program of DITHANE spray or dust will protect their crops against losses from blight.

2. **Better Vine Growth**—DITHANE permits normal plant growth. As a result Dithane sprayed potato vines are usually larger and greener than those sprayed with Bordeaux.

3. **Labor Saver**—DITHANE sprays are easy to mix and do not clog nozzles.

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culty in producing scab-free potatoes in some sections. In the opinion of many good potato growers, the disease is progressively getting worse. The scab disease is now considered enemy No. 1 by the potato growers of the Province, causing not only enormous losses to producers, but extreme dissatisfaction to consumers. No practical measures are known that will satisfactorily control the disease, although many of our good potato growers have repeatedly carried out various suggested control measures.

With the above facts in mind, a committee of growers from the Ontario Crop Improvement Association recently met Col. the Hon. T. L. Kennedy, Minister of Agriculture, urging organization of all the various forces, so that the problem might be dealt with as effectively as possible with all the scientific results mobilized in the attack on it.

Col. Kennedy assured the delegation of immediate definite attention, and that sufficient funds would be made available to provide the necessary staff and equipment to undertake the work, under the direct charge of the Botany Department, Ontario Agricultural College, Guelph, in co-operation with other Provincial and Dominion Departments of Agriculture, National Research Council, Western University and all other interested parties. The committee of growers named by the Ontario Crop Improvement Association will act in an advisory capacity.

Growers have indicated they will establish a substantial fund to be used as an honorarium for practical accomplishments.—R. E. Goodin.

POTATO SPRAYING IN PENNSYLVANIA

The selection of a fungicide for potato foliage diseases is now more complicated than in the past since several materials have given fair disease control. We must consider these facts in choosing the materials we intend to use.

1. Bordeaux at the 8-4-100 strength (8 pounds bluestone, 4 pounds of lime in 100 gallons of spray) continues to prevent foliage diseases effectively. It sticks well (builds residue on the leaves) and the effect is lasting. It may, except under unusually severe disease conditions be used at 7-day intervals. Because of the harshness of this fungicide, yields have often been less than where other fungicides were used.

2. Fixed or insoluble coppers are showing promise for the control of potato foliage diseases. They stick fairly well to the foliage but not as well as bordeaux, and where used care must be taken to get complete coverage at each application. In many tests and demonstrations yields have been above those in bordeaux-sprayed plots. These increased

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SUL-PO-MAG, a natural combination of these essential minerals, is mined and refined by International at Carlsbad, New Mexico. It provides the proper balance between potash and magnesium required for high yields of potatoes in magnesium-deficient soils. Both the potash and magnesium are in water soluble form and are immediately available for crops.

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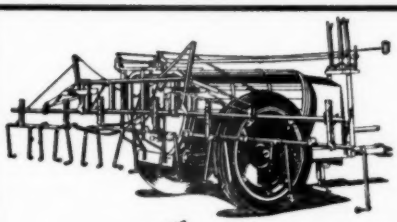

Up-to-Date Row Spraying

New Hardie Row Crop Spray Booms for big acreage work are saving time, labor and money for large scale growers. Advanced Hardie Row Sprayers in all sizes provide a new economy and speed for spraying 2 to 12 rows. Read about the new things in row spraying equipment in the big new Hardie 1948 Catalog sent on request.

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Hardie
Dependable Sprayers

yields have resulted from the less caustic effects of the materials. The amount suggested for potato spraying is 2 pounds of actual copper in 100 gallons of spray. To determine the number of pounds of any "fixed copper" used, first find out how much copper it contains then calculate the number of pounds, of the form used, than are needed to make two pounds of actual copper.

3. Organic fungicides such as Dithane D 14, Dithane Z 78, and Parzate have given fair foliage disease control and excellent growth and yields. They have been used at the amounts and time intervals suggested by the manufacturing companies. These amounts are Dithane D 14, 2 quarts plus 1 pound zinc sulphate to 100 gallons of spray and Dithane Z78 and Parzate, 2 pounds to 100 gallons of spray. These materials seemingly lose their ability to control foliage diseases after 5 days so that spraying at 5-day intervals is needed. Extreme care must be taken to get complete coverage at each application. Since heavy plant development occurs where these materials are used, the maturity date of the potatoes is later than where other sprays are used, and increased yields, in this case, may depend on allowing the potatoes to grow until maturity is reached.

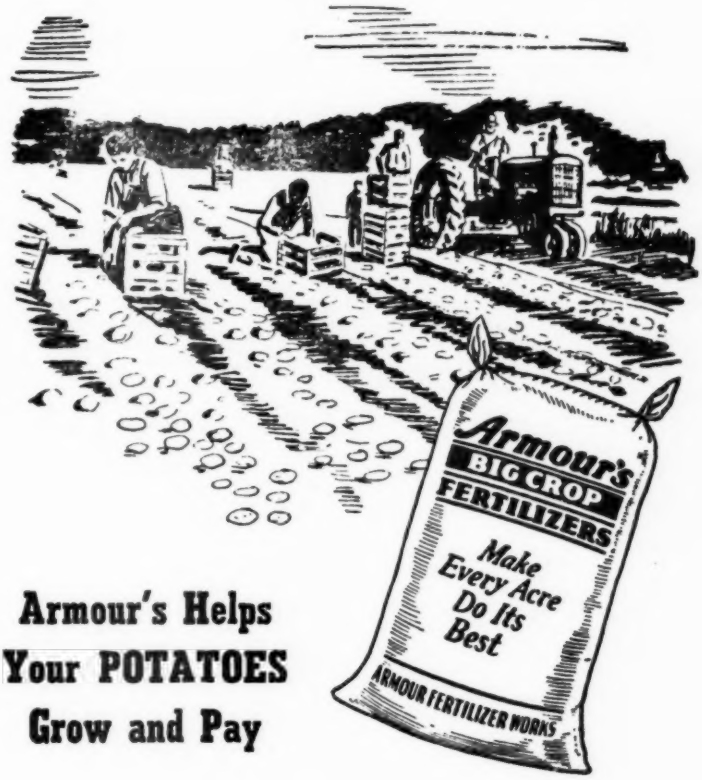
4. Zinc copper chromate (Crag) in experimental work has given excellent control of early blight and good control of late blight. Yields have equalled those secured with the fixed coppers. This material has been used at 3 pounds to 100 gallons of spray.

Whatever fungicide is selected for spraying, plans should be made to use DDT in combination with the fungicide. During the last three years the average yield increase obtained with the use of DDT has been more than 60 bushels per acre. DDT should be included in all sprays. Preferred for early season use on potato foliage are the DDT wettable powders. These powders should be used at the rate of 2 pounds of 50 per cent wettable DDT powder to each 100 gallons of fungicide. Later in the season liquid DDT emulsions (25 to 30 per cent concentration) may be used at the rate of 1 quart to each 100 gallons of spray. Injury is sometimes obtained on young potato vines with DDT emulsions.

Potato Dusts

Sprays have given better blight control and higher yields than have dusts in the same tests; however, some growers may continue to use dusts, because of water scarcity or for other reasons.

There are two types of dusts that can be mixed with DDT. Dithane or Parzate dust, and Fixed Copper dusts (7 per cent actual copper) can be combined with DDT to give satisfactory control of insects and partial control of diseases. These combination dusts should contain 3 per cent actual DDT in the finished dust.—O. D. Burke, H. Menusan, Jr.



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NEW POTATO VARIETIES INTRODUCED IN 1947

The leaders of the potato improvement projects in Canada and the United States have supplied the names of the following potato varieties introduced in 1947:

Yampa: (CS6317: Katahdin x S245-186) white, midseason maturity in Colorado, field resistant to scab, early and late blight, leaf roll and mosaic. Immune to x virus.

LaSoda: (Triumph x Katahdin) bright pinkish red skin, one week later than Triumph, medium vigor and upright vine.

Waseca, Chicago, and Satapa are smoother than Cobbler, have ranked with Cobbler in yield and have produced a higher proportion of U. S.-One size tubers than Cobbler and Red Warba in extensive trials for 5 or 6 years in Minnesota.

The seven varieties introduced by Dr. Reddick range from early to very late in maturity. They are only slightly susceptible to late blight.

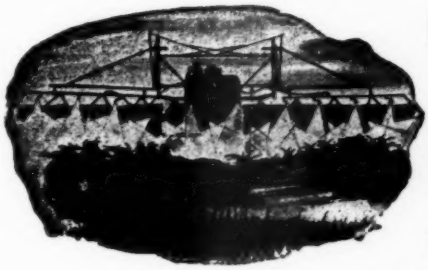
Thirteen new potato varieties introduced in 1947

Variety		Maturity (Early-Medium-Late	Reference
Yampa		M	L. A. Schaal USDA Colorado
LaSoda	red	M	Julian C. Miller Louisiana
Chicago		E	F. A. Krantz
Satapa	red	M	Minnesota
Waseca	red	E	
Cortland		L	Donald Reddick
Essex		E	New York
Fillmore		M	
Glenmeer	red	L	
Harford		L	
Madison		M	
Snowdrift		E	
Russet Sebago		L	G. H. Rieman Wisconsin

The relatively high resistance of these varieties may be fully adequate for areas where blight is not a serious problem. In blight areas they may relieve the grower of dusting or spraying throughout all but the latter part of the season.

Russet Sebago is a russet mutation of Sebago. It is more resistant to scab, and has a tougher skin which makes it better able to stand handling without injury. Russet Sebago has suffered slightly less scab

Others are using Geigy's GESAROL DDT INSECTICIDES to increase yields



How About You?

"Because of the late start of my wet-spray program, only three applications of your Gesarol DDT were made, starting about August 1st. Notwithstanding the date of the first application, the yield approximated 140 bbls. per acre to compare with about 80 bbls. per acre where none of your material was used."

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INSECTICIDES

What other Potato Growers have done you can do. Proper use of Geigy's GESAROL* AK 50 (a 50% DDT wettable powder for sprays) produces amazing results. Or if you prefer to dust, insist on GESAROL VD 50 in your mixture. Send today for specific information, FREE, on *how, when* and *where* to use these highly effective insecticides. Keep in touch with your county agent for local spray and dust schedules. If GESAROL DDT Insecticides are not available locally send us your dealer's name and address.

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injury than Russet Rural in Wisconsin trials. Scab pustules on Russet Sebago are usually shallow.

Inquiries for certified seed of these new varieties may be directed to Seed Potato certification officials.—HAROLD WATTSON, North Dakota Agricultural Experiment Station.

OUR ASSOCIATION RECOGNIZED

During my recent visit to many European countries I was very much pleased to learn that many scientific people were acquainted with our Association. I learned that several of them had been members and had received our magazine. Just now in occupied areas it is difficult to receive bulletins and technical material but this situation will clear itself as time goes on.

Many honors were accorded Mr. Mercker and myself because I represented the Potato Association. I want to pay tribute to our editor, Dr. W. H. Martin, who through the years has kept us on the map and I thought our membership would like to know just how we stood on the continent. (Mar. 31, 1948)—E. L. NEWDICK, *Pres.*

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